

1 **REMARKS**

2 No claims are canceled or added. Claims 46, 47, and 57 are amended.  
3 Claims 1-5, 10, and 19-63 remain in the application for consideration. In view of  
4 the following remarks, Applicant respectfully requests reconsideration and  
5 withdrawal of the rejections.

6  
7 **Request for Reconsideration of Petition**

8 Applicant respectfully requests reconsideration of Applicant's petition  
9 under 37 C.F.R. § 1.84(b)(2). In Paper No. 8, the Office denied the petition  
10 because Applicant's specification did not contain the required language noted by  
11 the Office. Applicant has now amended the specification to include the required  
12 language and therefore respectfully requests reconsideration and approval of  
13 Applicant's petition.

14  
15 **Allowed Subject Matter**

16 Claims 29-45 and claims 52-63 are indicated by the Office as allowed.  
17 Applicant thanks the Office for the indication of allowable subject matter.

18  
19 **§ 103 Rejections**

20 Claims 1-5 and 19-28 stand rejected under 35 U.S.C. § 103(a) over U.S.  
21 Patent No. 6,163,322 to LaChapelle.

22 Claim 10 stands rejected under 35 U.S.C. § 103(a) over LaChapelle in view  
23 of a document to Parke entitled *Computer Facial Animation*.

24 Claims 46-51 stand rejected under 35 U.S.C. § 103(a) over U.S. Patent No.  
25 6,351,269 to Georgiev in view of Parke.

1  
2 **Claims 1-18**

3 **Claim 1** recites a facial expression transformation method comprising  
4 [emphasis added]:

- 5
- 6 • defining a code book containing data defining a first set of facial  
7 expressions of a first person;
  - 8 • providing data defining a second set of facial expressions, the second  
9 set of facial expressions providing a training set of expressions of a  
10 second person who is different from the first person;
  - 11 • deriving a transformation function from the training set of  
12 expressions and *corresponding expressions* from the first set of  
13 expressions; and
  - 14 • applying the transformation function to the first set of expressions to  
15 provide a synthetic set of expressions.
- 16

17 In making out the rejection of this claim, the Office argues that LaChapelle  
18 discloses the recited act of “deriving” at column 9, lines 43-51. Specifically, the  
19 Office argues that “[i]t is inherent that the transformation function in the mapping  
20 template is derived because for this transformation to work, the transformation  
21 function would have to be different for each pair of performer’s faces and database  
22 entries.” The cited excerpt is reproduced below [emphasis added]:

23 Following the modelization stage 100, the registration stage 102  
24 maps markers located on a live performer, preferably *with the*  
25 *performer's face in his natural position*, onto points on the neutral  
facial expression  $E_0$  of the model in the synthetic coordinate space.  
This projection, herein referred to as the mapping template, takes into  
account the *geometric scaling discrepancies between the synthetic*  
*character model and the actor's face* in the case where the markers  
are placed on an actor's face.

1 As discussed in the cited excerpt, LaChapelle's system maps markers from  
2 the performer's face to the neutral facial expression of the model. This mapping  
3 between *only one expression*, i.e., the performer's "natural expression," and the  
4 neutral facial expression of the synthetic model takes into account *only* the  
5 geometric scaling discrepancies between the synthetic character model and the  
6 actor's face. This point is stressed just after the cited excerpt in column 9, lines 51-  
7 54, reproduced below [emphasis added]:

8 This scaled projection forms *the link* between the synthetic character  
9 and the performer and allows transferring proper marker  
10 displacements to the system.

11 Thus, LaChapelle appears to map *only one* expression from his live  
12 performer to the synthetic character. This constrains him to take into account *only*  
13 the geometric scaling discrepancies between the performer and the synthetic  
14 character. In contrast, Applicant derives a transformation function from the  
15 training set of expressions to *(multiple) corresponding expressions* from the first  
16 set of expressions. This allows Applicant to take into account *more than* just static  
17 discrepancies between the proportions of the performer and the synthetic  
18 character. Applicant's claimed subject matter is capable of compensating for  
19 *dynamic* differences in the manner in which different people make the same  
20 expression. As LaChapelle neither discloses nor suggests any such subject matter,  
21 this claim is allowable.

22 **Claims 2-5 and 10** depend from claim 1 and are allowable as depending  
23 from an allowable base claim. These claims are also allowable for their own  
24 recited features which, in combination with those recited in claim 1, are neither  
25 disclosed nor suggested in the references of record, either singly or in combination

1 with one another. Given the allowability of claim 1, the rejection of claim 10 over  
2 the combination with Parke is not seen to add anything of significance.

3  
4 **Claims 19-23**

5 **Claim 19** recites one or more computer-readable media having computer-  
6 readable instructions thereon which, when executed by a computer, cause the  
7 computer to [emphasis added]:

- 8
- 9 • operate on a training set of expressions from one person and  
10 corresponding expressions from a code book of another person to  
11 compute a linear transformation function from the training set and  
12 *their corresponding expressions*; and
  - 13 • apply the transformation function to a plurality of expressions from  
14 the code book to provide a synthetic set of expressions.
- 15

16 In making out the rejection of this claim, the Office argues that LaChapelle  
17 computes a linear transformation function from the training set and their  
18 corresponding expressions at column 9, lines 43-51, which was reproduced above.

19 As discussed in the cited excerpt, LaChapelle's system maps markers from  
20 the performer's face to the neutral facial expression of the model. This mapping  
21 between *only one expression*, i.e., the performer's "natural expression," and the  
22 neutral facial expression of the synthetic model takes into account *only* the  
23 geometric scaling discrepancies between the synthetic character model and the  
24 actor's face. This point is stressed just after the cited excerpt in column 9, lines 51-  
25 54, reproduced below [emphasis added]:

26 This scaled projection forms *the link* between the synthetic character  
27 and the performer and allows transferring proper marker  
28 displacements to the system.

1 Thus, LaChapelle appears to map *only one* expression from his live  
2 performer to the synthetic character. This constrains him to take into account *only*  
3 the geometric scaling discrepancies between the performer and the synthetic  
4 character. In contrast, Applicant computes a linear transformation function from  
5 the training set and *their (multiple) corresponding expressions*. This allows  
6 Applicant to take into account *more than* just static discrepancies between the  
7 proportions of the performer and the synthetic character. Applicant's claimed  
8 subject matter is capable of compensating for *dynamic* differences in the manner  
9 in which different people make the same expression. As LaChapelle neither  
10 discloses nor suggests any such subject matter, this claim is allowable.

11 **Claims 20-23** depend from claim 19 and are allowable as depending from  
12 an allowable base claim. These claims are also allowable for their own recited  
13 features which, in combination with those recited in claim 19, are neither disclosed  
14 nor suggested in the references of record, either singly or in combination with one  
15 another.

16  
17 **Claims 24-28**

18 **Claim 24** recites a facial expression transformation system comprising  
19 [emphasis added]:  
20

- 21 • a code book embodied on a computer-readable medium, the code  
22 book containing data defining a first set of facial expressions of a  
first person;
- 23 • data embodied on a computer-readable medium, the data defining a  
24 second set of facial expressions, the second set of facial expressions  
25 providing a training set of expressions of a second person who is  
different from the first person; and

- a transformation processor configured to derive a transformation function from the training set of expressions and *corresponding expressions* from the first set of expressions.

In making out the rejection of this claim, the Office argues that LaChapelle discloses the claimed transformation processor at column 9, lines 43-51, which was reproduced above.

As discussed in the cited excerpt, LaChapelle's system maps markers from the performer's face to the neutral facial expression of the model. This mapping between *only one expression*, i.e., the performer's "natural expression," and the neutral facial expression of the synthetic model takes into account *only* the geometric scaling discrepancies between the synthetic character model and the actor's face. This point is stressed just after the cited excerpt in column 9, lines 51-54, reproduced below [emphasis added]:

This scaled projection forms *the link* between the synthetic character and the performer and allows transferring proper marker displacements to the system.

Thus, LaChapelle appears to map *only one* expression from his live performer to the synthetic character. This constrains him to take into account *only* the geometric scaling discrepancies between the performer and the synthetic character. In contrast, Applicant's transformation processor is configured to derive a transformation function from the training set of expressions and *(multiple) corresponding expressions* from the first set of expressions. This allows Applicant to take into account *more than* just static discrepancies between the proportions of the performer and the synthetic character. Applicant's claimed subject matter is capable of compensating for *dynamic* differences in the manner in which different

1 people make the same expression. As LaChapelle neither discloses nor suggests  
2 any such subject matter, this claim is allowable.

3 **Claims 25-28** depend from claim 24 and are allowable as depending from  
4 an allowable base claim. These claims are also allowable for their own recited  
5 features which, in combination with those recited in claim 24, are neither disclosed  
6 nor suggested in the references of record, either singly or in combination with one  
7 another.

8  
9 **Claim 46**

10 As amended, **claim 46** recites a method of animating facial features  
11 comprising [emphasis added]:

- 12
- 13 • defining a subdivision surface that approximates geometry of a  
14 plurality of different faces;
  - 15 • fitting the same subdivision surface for *only one expression* to each  
16 of the plurality of faces to establish a correspondence between the  
17 faces for a *plurality of expressions*; and
  - 18 • using the correspondence between the faces to transform an  
19 expression of one face into an expression of another face.

20 In making out the rejection of this claim, the Office admits that Parke, the  
21 now-secondary reference, does not disclose fitting the same subdivision surface to  
22 each of the plurality of faces to establish a correspondence between the faces and  
23 using the correspondence between the faces to transform an expression of one face  
24 into an expression of another face. Applicant agrees.

25 The Office then relies on Georgiev and cites to column 4, lines 47-61, as  
disclosing these elements. The cited excerpt is reproduced below:

Turning now to FIG. 6, an example of a transformation which "transports" a facial expression from an image of one person to another is shown. Given an original face 300, which is not smiling, and a smiling face 302 of the same person, a new face 304 of another person can be morphed to simulate the second person's smiling in exactly the same way as the original face 300. In this example, a 2-D morph space for a 3-image morphing (the 3 input images being 300, 302 and 304) is determined by finding the change vector 301 from the neutral face 300 to the smiling face 302 and by applying the 3-image morphing to add the change to the new face 304. The result is a smiling new face 306. By scaling the change vector we can achieve any degree of smiling, even "inverse smiling". The change vector 301 may be applied to any other images.

Specifically, the Office argues that "the 'subdivision surface' is the 3-image morphing in 1.57. The 3-image morphing is a 'subdivision surface' because any given morphing constitutes a 'subdivision' of different expressions (see col. 4, ll. 36-43). The 'correspondence between the faces' is the 'transport' of a facial expression from one image to another (see col. 4, ll. 47-49). Finally, the same subdivision surface can be applied to a plurality of faces using the change vector (see col. 4, ll. 60-61)."

Applicant respectfully submits that the Office appears to misinterpret what is meant by the term "subdivision surface" and its context in this claim.

In order to aid the Office in appreciating the patentable distinctions between Georgiev's "change vector" and Applicant's claimed subject matter, the Office's attention is respectfully drawn to the specification starting at page 27, line 9, and continuing through page 28, line 10, which describes *but one way* of implementing the claimed method. This excerpt from the specification is reproduced below [emphasis added]:

Fig. 10 is a flow diagram that describes steps in a method for building a face model in accordance with this described embodiment. The method can



1 be implemented in any suitable hardware, software, firmware or  
2 combination thereof. In the present example, the method is implemented in  
3 software.

3 Step 1000 measures 3D data for one or more faces to provide  
4 corresponding face models. In the above example, the 3D data was  
5 generated through the use of a laser range scan of the faces. It will be  
6 appreciated that any suitable method of providing the 3D data can be used.  
7 Step 1002 defines a generic face model that is to be used to fit to the one or  
8 more face models. It will be appreciated that the generic face model can  
9 advantageously be utilized to fit to many different faces. Accordingly, this  
10 constitutes an improvement over past methods in which this was not done.  
11 In the example described above, the generic face model comprises a mesh  
12 structure in the form of a coarse triangle mesh. The triangle mesh defines  
13 subdivision surfaces that closely approximate the geometry of the face. ***In***  
14 ***the illustrated example, a single base mesh is used to define the***  
15 ***subdivision surfaces for all of the face models.*** Step 1004 selects specific  
16 points or constraints on the generic face model. These specific points or  
17 constraints are mapped directly to corresponding points that are marked on  
18 the face model. The mapping of these specific points takes place in the  
19 same manner for each of the many different possible face models. Step  
20 1006 fits the generic face model to the one or more face models. This step  
21 is implemented by manipulating only the positions of the vertices to adapt  
22 to the shape of each different face. During the fitting process continuous  
23 optimization is performed only over the vertex positions so that the  
24 connectivity of the mesh is not altered. In addition, the fitting process  
25 involves mapping the specific points or constraints directly to the face  
model. In addition, a smoothing term is added and minimized so that the  
control mesh is encouraged to be locally planar.

18 Applicant has amended this claim in an attempt to further clarify that claim  
19 46 involves fitting the same subdivision surface for ***only one expression*** to each of  
20 the plurality of faces to establish a correspondence between the faces for a  
21 ***plurality of expressions***. Neither Georgiev's change vector, nor any other aspect  
22 of his system, discloses or suggests fitting the same subdivision surface for ***only***  
23 ***one expression*** to each of the plurality of faces to establish a correspondence  
24 between the faces for a ***plurality of expressions***.  
25

1 Accordingly, for at least this reason, this claim is allowable.

2  
3 **Claims 47-51**

4 As amended, **claim 47** recites a method of animating facial features  
5 comprising [emphasis added]:

- 6
- 7 • measuring 3-dimensional data for a plurality of different faces to  
8 provide corresponding face models;
  - 9 • defining only one generic face model that is to be used to map to  
10 each corresponding face model;
  - 11 • selecting a plurality of points on the generic face model that are to be  
12 mapped directly to corresponding points on each of the  
13 corresponding face models; and
  - 14 • fitting the generic face model to each of the corresponding face  
15 models for *only one expression* to establish a correspondence  
16 between the faces for a *plurality of expressions*, said fitting  
17 comprising mapping each of the selected points directly to the  
18 corresponding points on each of the corresponding face models.

19  
20 In making out the rejection of this claim, the Office argues that Georgiev  
21 discloses the recited act of fitting at column 4, lines 60-61. The cited excerpt is  
22 reproduced below:

23  
24 The change vector may be applied to any other images.

25  
26 Applicant has amended this claim in an attempt to further clarify that the  
27 recited act of fitting comprises fitting the generic face model to each of the  
28 corresponding face models for *only one expression* to establish a correspondence  
29 between the faces for a *plurality of expressions*. Neither Georgiev's change  
30 vector, nor any other aspect of his system, discloses or suggests fitting the generic

1 face model to each of the corresponding face models for *only one expression* to  
2 establish a correspondence between the faces for a *plurality of expressions*, where  
3 the fitting comprises mapping each of the selected points directly to the  
4 corresponding points on each of the corresponding face models.

5 Accordingly, for at least this reason, this claim is allowable.

6 **Claims 48-51** depend from claim 47 and are allowable as depending from  
7 an allowable base claim. These claims are also allowable for their own recited  
8 features which, in combination with those recited in claim 47, are neither disclosed  
9 nor suggested in the references of record, either singly or in combination with one  
10 another.

11  
12 **Conclusion**

13 All of the claims are in condition for allowance. Accordingly, Applicant  
14 requests a Notice of Allowability be issued forthwith. If the Office's next  
15 anticipated action is to be anything other than issuance of a Notice of Allowability,  
16 Applicant respectfully requests a telephone call for the purpose of scheduling an  
17 interview.

18 Respectfully Submitted,

19  
20 Dated: 3/31/04

21 By: 

22 Lance R. Sadler  
23 Reg. No. 38,605  
24 (509) 324-9256  
25